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Int. Cl.:—F 16 d.

COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in or relating to Brake Discs for Disc Brake arrangements

We, KNORR-BREMSE G.M.B.H., a German Company, of Moosacher Strasse 80, Munich, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to brake discs for disc brake arrangements, and is particularly, although not exclusively, applicable to rail vehicles.

In some known brake discs, connecting members are provided for connecting a hub member to a surrounding friction ring, the connecting member having the form of solid core bolts or shoulder screws. In order to take up radial movements of the friction ring, which may be comparatively large owing to the material composition, and which are directed towards the hub under the effects of thermal expansion, the connecting members are connected with the hub or with the friction ring through radial sliding guides permitting a relative movement. The manufacture of these sliding guides is expensive and they form wearing parts which complicate the maintenance of the disc brake arrangements in which these discs are incorporated.

According to the present invention there is provided a brake disc for a disc brake arrangement, the brake disc comprising a hub, a friction ring surrounding the hub, and connecting members for connecting the hub to the friction ring, the connecting members comprising longitudinally slotted collets which pass through bores common to the hub and the friction ring and which are each axially disposed with respect to said hub, the collets being so arranged as to permit limited movement between the hub and the friction ring in a radial direction, but to substantially prevent relative rotational movement therebetween.

The collets are preferably very elastic, and owing to their longitudinal slots can absorb in this arrangement the thermally conditioned relative movements between hub and friction discs.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made by way of example, to the accompanying drawings, in which:—

Fig. 1 is a front elevation of one embodiment of the invention;

Fig. 2 is a front elevation of a part of the embodiment shown in Fig. 1;

Fig. 3 is a sectional view, drawn to a larger scale, of a detail of another embodiment;

Fig. 4 is an axial sectional view of a detail of a further embodiment; and

Fig. 5 is an axial sectional view of a detail of a still further embodiment of the invention.

In Fig. 1 of the drawings, there is shown a brake disc for a disc brake arrangement, the brake disc comprising a hub 1, made of cast steel, and a friction ring 2, made of grey cast iron. The hub 1 is shown alone in Fig. 2, and has on its periphery radially projecting lugs 4 each of which is formed with a bore 3 extending parallel to the main central bore of the hub. The friction ring 2 has on its inner periphery radially inwardly projecting lugs 5, corresponding in arrangement and location to the lugs 4. As shown in Fig. 1, when the friction ring is mounted on the hub, the lugs 4 are disposed in side-by-side relationship with the lugs 5, and longitudinally slotted collets or clamping sleeves 6 are pressed into the bores 3 and into bores of the lugs 5 which are aligned therewith. Each

[Price 4s. 6d.]

sleeve 6 is formed with a longitudinally extending slot 7 which, when the sleeves 6 are arranged in the bores of the lugs 4 and 5, are all located in a circle concentric with axis of rotation of the hub 1 and spaced radially from the circumference of the hub 1 (ignoring the lugs 4). In Fig. 1 all the slots 7 are shown facing in the same direction of rotation, i.e. clockwise. With this arrangement, the clamping sleeves 6 are very elastic in the radial direction of the brake disc, and permit radially directed relative movement between the lugs 5 and the lugs 4, caused by thermal expansion.

In order to produce a rigid connection between the hub 1 and the friction ring 2 which will reduce to a minimum any relative rotational movement between the two parts, which connection may be necessary to avoid vibration during braking, support members 8 may be fitted into the clamping sleeves, as shown in Fig. 3. Each support member engages or rests against opposing side portions of the interior surface of its respective sleeve 6 which portions are disposed on opposite sides of a radial plane of the disc passing through the common axis of the bores of the lugs. The support members 8 do not engage portions of the sleeves 6 disposed radially with aspect to the disc, i.e. as seen in Fig. 3, portions at the top and bottom of the sleeve 6, because they are formed longitudinally and on opposing sides with flats. In this way, a certain amount of play is obtained in the radial direction whilst relative rotational movement between the hub 1 and friction ring 2 is substantially prevented.

In order to produce a symmetrical mounting of the friction ring 2, the lugs 4 may be formed with grooves, which correspond in width to the lugs 5, as shown in Fig. 4, and which form a circumferential channel around the periphery of the hub. In order to introduce the lugs 5 into the grooves, adjacent lugs 4 must be spaced apart circumferentially by a distance greater than the circumferential width of one of the lugs 5. Moreover, the support members 8 are preferably formed as the shanks 9 of securing bolts, which are made with two longitudinally extending flats on opposite sides of their shanks. The heads of the securing bolts, or their nuts, prevent longitudinal displacement of the clamping sleeves 6. In addition, by means of these securing bolts, the two parts of each lug 4 divided by the groove may be drawn together so that a connection between the lugs 4 and 5 may be made which allows no clearance in the axial direction of the hub.

Grooves may also be machined into the lugs 5, but here the drawing together of the parts of each lug by securing bolts is impossible.

In the embodiment illustrated in Fig. 5, the friction ring 2 is formed with radial cooling air channels 10. Conveniently, the radially inner ends 11 of the cooling channels 10 are located between the lugs 4 and 5 in the peripheral direction of the brake disc. In this manner, an unrestricted cooling air intake is provided.

WHAT WE CLAIM IS:—

1. A brake disc for a disc brake arrangement, the brake disc comprising a hub, a friction ring surrounding the hub, and connecting members for connecting the hub to the friction ring, the connecting members comprising longitudinally slotted collets which pass through bores common to the hub and the friction ring and which are each axially disposed with respect to said hub, the collets being so arranged as to permit limited movement between the hub and the friction ring in a radial direction, but to substantially prevent relative rotational movement therebetween.

2. A brake disc as claimed in claim 1, wherein the longitudinally arranged slots of the collets are all located in a circle concentric with the axis of rotation of the hub, each slot lying in a plane which is disposed at right angles to a radial plane of the hub passing through the axis of the respective collet.

3. A brake disc as claimed in claim 2, wherein the slots are arranged facing in the same direction of rotation.

4. A brake disc as claimed in claim 2 or 3, wherein support members are arranged in the collets and each support member engages opposing side portions of the interior surface of its respective collet, which portions are disposed on opposite sides of a radial plane of the disc passing through the common bores, and provides a clearance in the radial direction between it and the inner surface of the collet.

5. A brake disc as claimed in claim 4, wherein the support members are shanks which are formed with flats on two opposing longitudinal sides thereof, the shanks belonging to securing bolts which pass through the collets.

6. A brake disc as claimed in any of claims 1 to 5, wherein the hub has peripherally distributed, radially outwardly projecting lugs and the friction ring has an equivalent number of radially inwardly projecting lugs which are arranged axially adjacent the lugs of the hub, the bores common to the ring and the hub being arranged in the said lugs.

7. A brake disc as claimed in claim 6, wherein the friction ring is formed with radially disposed cooling air channels.

8. A brake disc as claimed in claim 7, wherein the radially inner ends of the cooling air channels are disposed between the lugs.

9. A brake disc as claimed in claim 6, 7 or 8, wherein the lugs of the hub are smaller than the interspaces between the lugs of the

friction ring and the lugs of the friction ring are smaller than the interspaces between the hub lugs, the lugs of the hub or of the friction ring being formed with a circumferential groove for receiving the lugs of the ring or hub respectively.

10. A brake disc as claimed in any one of the preecding claims, wherein the hub is made of cast steel and the friction ring of grey cast iron.

11. A brake disc for a disc brake arrangement, the brake disc being substantially as hereinbefore described with reference to any one of the embodiments illustrated in the accompanying drawings.

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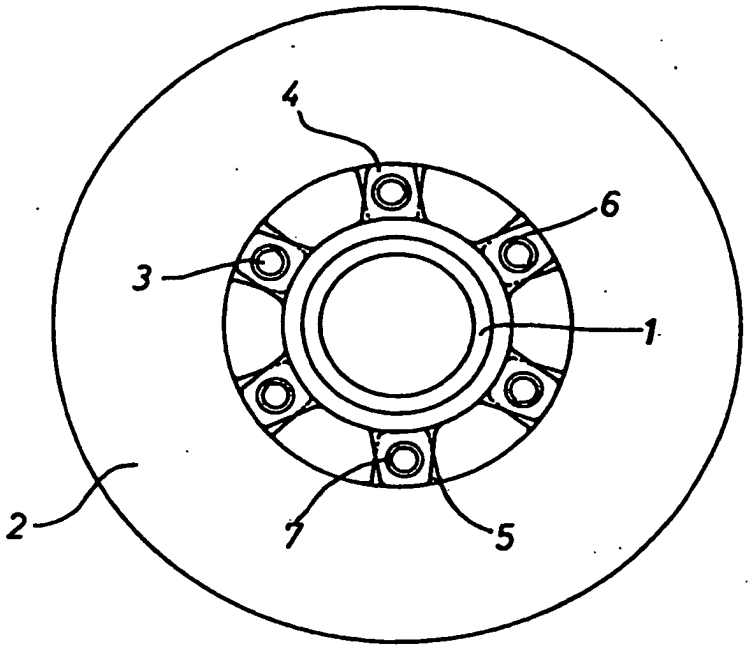

Fig.1

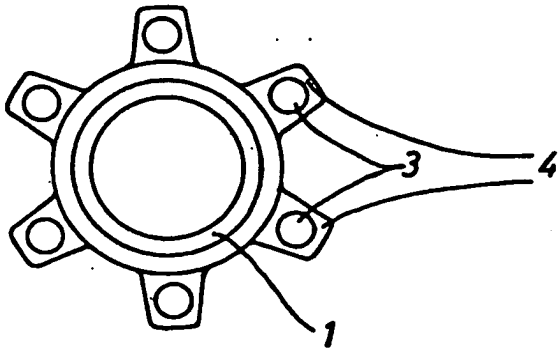

Fig.2

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1,080,035 COMPLETE SPECIFICATION
2 SHEETS
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SHEETS 1 & 2

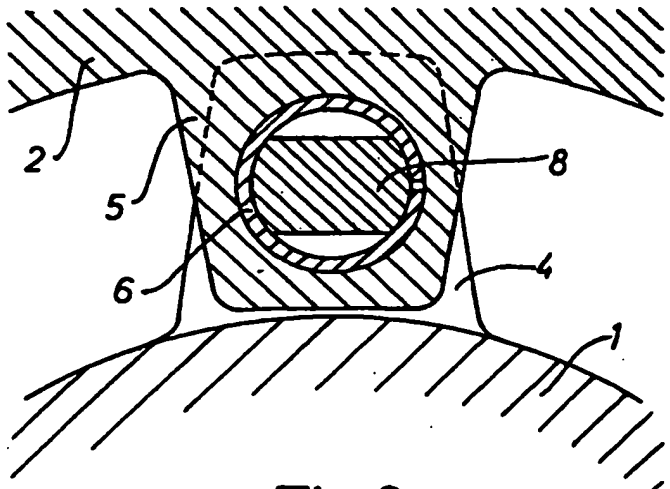

Fig.3

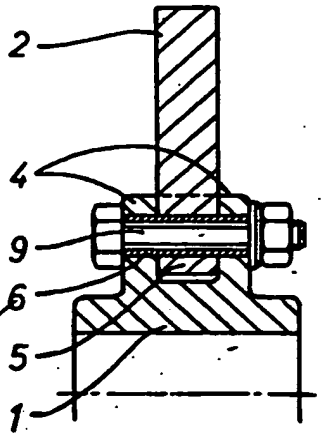

Fig.4

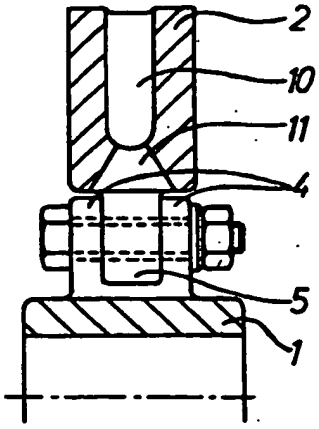

Fig.5

elastic clamping sleeves (for thermal expansion)